REMARKS

In response to the Examiner's Action mailed March 12, 2001, Applicants amend their application and request reconsideration. In this Amendment, no claims are cancelled and claims 6-16 are added so that claims 1-16 are now pending.

The Examiner raised questions about two portions of the specification. Both locations where there was a potential misunderstanding include minor translational errors that are corrected here. With regard to the passage at page 2, lines 5-7, the Examiner's understanding of the cited sentence is correct. The sentence is changed in accordance with the Examiner's understanding.

The other cited item also appears on page 2. The Examiner question how "a 9 layer bi-cell structure" is formed when the description refers to a structure including seven layers. As understood by one of skill in the art, what is described having seven layers is a bi-cell. The reference at page 2, line 12, is to forming a battery by stacking nine of the bi-cell structures. This passage is clarified in the foregoing Amendment. Since similar language appears in the application at page 6, a similar amendment is made to that portion of the specification. In addition, a few other minor amendments are made to the specification merely for the purpose of clarity.

Claim 1 is amended to specify that the positive collector is a metal having openings. The negative collector is also defined more precisely as a metal foil free of holes. Claim 4 is amended to eliminate an informality.

New claim 6 is added, specifying that the active material layers of the respective positive and negative plates are disposed on both sides of the respective collectors. New claim 7 is similar to claim 1 but limits the negative collector to a metal foil. Claims 8, 9, 10, 11, and 12 are derived from examined claims 2, 3, 5, 4, and 6, respectively. New claims 13 and 15 describe a battery in which a plurality of bi-cells as described in claims 1 and 7 are stacked and interconnected through positive and negative taps to form the terminals of the battery. Claims 14 and 16 are derived from claim 2. Claims 13-16 are clearly supported by the application as filed and particularly by the experimental example described at page 6, lines 11-16.

The invention concerns a lithium polymer battery and bi-cell. In a bi-cell, a positive collector is a metal that includes a plurality of openings, i.e., holes. The bi-cell includes a negative collector that is a metal foil free of holes. The foil is preferably copper. The bi-cell includes active layers, that are applied as slurries, on each of the positive and negative collectors. The slurries include a plasticizer as does a separator placed between the positive plate and the negative plate. Each plate includes the respective collector and active layer or layers. The plasticizer is removed with a solvent, such as ether, and replaced by electrolyte when the battery is assembled. By using a metal foil that is free of holes as the negative collector, the internal resistance of the bi-cell can be reduced without undue interference in the extraction of the plasticizer from the active layers. These advantages, i.e., low resistance and no reduction is ability to remove plasticizer, are readily apparent from the experimental examples described in the patent application at page 6.

All of the examined claims 1-5 were rejected as anticipated by Kejha (U. S. Patent 5,750,289). This rejection is respectfully traversed.

It is fundamental that to anticipate a claim, the reference must disclose every element of the claim. Kejha does not meet that requirement.

First, Kejha describes current collectors and current carriers for a battery but does not describe a separator within a battery, an element of examined claims 1-5. The Examiner did not refer, in applying Kejha to claims 1-5, to any separator. Perhaps that claim element was overlooked. Kejha refers to a layer 25 between the positive and negative plates as a polymeric electrolyte separating the two current collecting structures of his alkali metal-polymer battery. That electrolyte clearly does not provide the insulating function of the separator of claims 1-5. For that simple reason, i.e., the absence of a separator, there can be no anticipation of claims 1-5 by Kejha.

There is a second, even more important reason why Kejha fails to anticipate any of claims 1-5 or any claim now pending. That reason is that Kejha does not describe any collector comprising a metal having a plurality of openings or any combination of collectors in which one collector has holes and the other collector does not. The Examiner's express or implied assertion to the contrary in the Official Action apparently results from an incomplete comparison of the figures of Kejha to the present claims. A comparison must be made

between the text and figures of Kejha, taken in combination, and the present claims in determining whether the claims are patentable.

In describing the current collector 21 shown in Figure 1 of Kejha, that patent states as follows:

> "The ribbon 21A is coated by any well known method for metallizing plastic films such as vacuum deposition or electroless metal plating, which coating 23 is of metal, which is selected to be compatible with the battery chemistry and components. The coating 23 may be on one or both sides of, or may completely encapsulate, the ribbon 21A. The coating 23 supports the specific current collecting and carrying capabilities as required by the device in which it is incorporated.
>
> The coating 23 does not close the holes 22 which holes can take up to approximately 90% (percent) of the surface are[a] of the ribbon 21A." (Kejha, column 3, line 63-column 4, line 7.)

There is no indication in this passage that there are any holes whatsoever in any metal film 23 of the current collector 21. Figure 1 of Kejha is entirely ambiguous as to whether the metal covers the holes 22 in the plastic film 21A. However, Figure 1 shows that none of the metal film 23 is inside the holes or covers their inner surfaces. According to the cited passage, the metal film, when present on both sides of the plastic film, "may completely encapsulate" the plastic film. There is no way there could be a complete encapsulation based on the ordinary meaning of that term and Figure 1 of Kejha unless the holes in the plastic ribbon 21A are closed by the metal film, i.e., the metal is free of holes. The explanation in Kejha that the coating, i.e., metal film 23, does not "close" the holes clearly means that the metal film does not fill up the holes as is apparent from Kejha's Figure 1 and the absence of any metal on the sidewalls of the holes in the ribbon 21A.

Moreover, if the metal film filled the holes, the entire purpose of employing the plastic film in Kejha would be destroyed. It is obvious that Kejha's purpose of employing the plastic film 21A is to provide a substrate that supports the coatings, i.e., metal films 23, that are much thinner and lighter than a self-supporting metal plate. The holes are present in the plastic film in order to reduce the weight of the battery even further. The background of Kejha makes clear that the entire purpose of the collector structure described in Kejha is to reduce weight and size by eliminating a solid metal plate. The objective of Kejha is

achieved by using a thin metal film 23 that is so thin that it does not provide its own support, requiring a substrate such as the plastic ribbon 21A.

In summary, when what is actually disclosed in Kejha is considered, it is apparent that Kejha does not describe any current collector structure that includes a metal foil or metal film including openings or holes. Therefore, because Kejha fails to meet the limitation of the examined claims that the positive collector comprises a metal having a plurality of openings, Kejha cannot anticipate any claim pending in this application. Kejha has simply been misinterpreted, presumably based upon Figures 1 and 2 of Kejha with an understanding of the claimed structure in mind.

Even if, for the sake of argument, it is assumed that Kejha's metallizations 23 include holes aligned with the openings 22 of the plastic film 21A, there still can be no anticipation of any claim now pending by Kejha. In the claimed structure, the positive collector comprises a metal having a plurality of openings and a negative collector that is a metal foil free of openings. In addition, at least one surface of each of the positive and negative collectors is covered by an active material. If, for the sake of argument, it is assumed that the current collector 21 of Figure 1 of Kejha does include openings in the metal coatings 23, then that collector might be compared to the positive collector of the claims. However, there would still be substantial differences between the negative collector of the claims and the anodic layer 26 of Kejha, preventing anticipation.

According to Kejha at column 4, lines 25-29, that anodic layer 26 may have either of two alternative embodiments. In the first embodiment, the anodic layer 26 is a solid body, as in Figure 1 of Kejha, e.g., an alkali metal foil or an alkali metal alloy foil. In that event, Kejha still cannot meet the terms of any claim now pending because the negative collector of the claims, that is free of holes, is coated with a negative active material layer. There is no corresponding negative active layer on the anodic layer 26 in the embodiment of Figure 1 of Kejha, preventing anticipation.

The second embodiment described by Kejha for the anodic layer 26 is shown in Kejha's Figure 2. That collector includes a lithiated carbon compound 27 coating a plastic film 28 that includes holes and that is metallized, i.e., is essentially identical to the current collector 21 of Kejha's Figure 1. A battery structure including that current collector in place of the anodic layer 26 of Figure 1 of Kejha would include a positive collector and a negative

collector, both of which, in the interpretation being applied now, would have holes. Therefore, this structure could not anticipate any claim now pending since the claimed structures require one collector with holes and one collector without holes. Alternatively, both of Kejha's collectors could include holes, still not the claimed invention.

For these additional reasons, the rejection of claims 1-5 as anticipated by Kejha should be withdrawn and that rejection should not be applied to any of the newly added claims 6-16.

As described in the patent application, the bi-cell structure is manufactured using a plasticizer that is subsequently removed by soaking the structure in a solvent, such as ether. No similar step is described by Kejha. No separator is present in Kejha For those reasons, it is apparent that the battery structure described by Kejha is substantially different from that of the invention. Thus, one of skill in the art would not find a teaching in Kejha to modify the prior art structure described in the patent application to suggest the invention. There would be no such teaching because Kejha includes no provision for extracting a plasticizer and, therefore, is not relevant to the claimed invention. Thus, for this independent reason, Kejha cannot anticipate any of the examined claims nor suggest modification of a prior art structure, like that described in the patent application, to produce the invention as defined by the claims. The rejection based upon Kejha should be withdrawn.

With regard to the newly submitted claims 7-12, 15, and 16, it is notable that the current collecting structure of Kejha, described with respect to Kejha's Figure 1, is relatively complex. It includes a plastic ribbon 21A to which a metallic film is applied, on one or both opposite surfaces, so that the openings in the plastic ribbon are not filled with metal. Thus, the complex negative current collector in Kejha cannot meet the terms of newly submitted claims 7-12, 15 and 16 and cannot anticipate nor even make obvious any of those claims.

Examined claims 1-5 were also rejected as anticipated by Satake et al. (U. S. Patent 6,096,455, hereinafter Satake). This rejection is respectfully traversed.

Satake is directed to current collectors that may be used in batteries, elements that may correspond to the positive collector and the negative collector of the claims. Each of Satake's current collectors is punched to provide an unusual kind of projection extending from one side of each of the metal current collectors. The function of these projections is to provide increased adhesion between the active material layers that are applied to the current

collectors of both the cathode and anode than if the current collectors are smooth or free of holes or the projections described by Satake. Satake never makes any distinction between the structure of a positive plate or negative plate and is concerned solely with a symmetrical battery structure.

Satake is different from the invention as defined by all of the claims pending in several ways. In Satake, unlike the invention defined by the amended claims, no current collector is free of holes and projections. For that reason, Satake cannot anticipate any claim now pending. Further, Satake cannot suggest the structures defined by the claims now pending. In the invention, as defined by the amended claims, the negative collector is free of holes but the positive collector includes holes. The teaching of Satake is that holes and the associated projections are a substantial improvement with regard to the adhesion of the slurries applied to the current collectors. Thus, the teaching of Satake is the use of current collectors with holes and corresponding projections in each of the positive and negative collectors. Nowhere does Satake suggest using the punched metal for only one of the current collectors. One of skill in the art would never understand from Satake that one of the current collectors should be free of such holes and corresponding projections while the other current collector of a bi-cell would include such holes. Therefore, Satake can neither anticipate nor suggest any claim now pending and the rejection should be withdrawn.

Reconsideration and allowance of claims 1-16 are earnestly solicited.

Respectfully submitted,

LEYDIG, VOIT & MAYER, LTD.

Jeffrey A. Wyand,
Registration No. 29,458

Suite 300
700 Thirteenth Street, N. W.
Washington, D. C. 20005
Telephone: (202) 737-6770
Facsimile: (202) 737-6776
Date: June 11 2001
JAW:cmcg

PATENT
Attorney Docket No. 400396

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

CHANG et al.

Application No.:	09/416,270	Art Unit:	1745
Filed:	October 12, 1999	Examiner:	T. Dove
For:	LITHIUM POLYMER BATTERY		

SPECIFICATION, CLAIMS, AND ABSTRACT AS AMENDED IN RESPONSE TO THE OFFICIAL ACTION MAILED MARCH 12, 2001

Amendments to the paragraph beginning at page 2, line 1:

First, acetone as a solvent, a positive or negative active material, a binder, a conductive material and a plasticizer are mixed to prepare a slurry. Then the slurry is deposited on a polyethylene (PET) base film with a doctor blade to form a thin sheet, the PET base film is removed to ~~obtain~~ produce an electrode sheet ~~formed~~ of the corresponding active material. Then, ~~both surfaces of~~ the electrode sheets are laminated to both surfaces of each collector at a high temperature by applying pressure, and then cut to a predetermined size.

Amendments to the paragraph beginning at page 2, line 8:

The resulting positive and negative plates 11 and 12 are combined with the separator 13 interposed therebetween, and the stacked structure is further laminated ~~further~~ at a high temperature by applying pressure, thereby resulting in a bi-cell structure. Then, the bi-cell structure is soaked in ether to extract the plasticizer. Then, an electrode assembly is formed ~~having a~~ by stacking ~~9-layer bi-cell structure~~ of the bi-cells. Then, positive and negative terminals are welded onto the assembly, and electrolyte is infiltrated

into the empty space from which the plasticizer has been extracted. Finally, a ~~casing~~ case is formed around the resulting product.

Amendments to the paragraph beginning at page 4, line 7:

The electrode assembly 20 is formed by repeatedly stacking a positive plate 21 and a negative plate 22 with a separator 23 interposed therebetween, and positive taps 26a and negative taps 24a ~~are extended~~ extend from the positive plates 21 and the negative plates 22, respectively.

Amendments to the paragraph beginning at page 6, line 11:

The amount of plasticizer extracted from the conventional battery adopting the negative collector 12a which is made of a expanded Cu and has openings was compared with that of the battery adopting Cu foil as the negative collector 22a according to the present invention. Here, each electrode assembly had ~~a 9-layer bi-cell structure~~ bi-cells, and (15% total volume) the plasticizer was used for the preparation of the bi-cells.

Amendments to the existing claims:

1. (Twice Amended) A lithium ~~(Li)~~ polymer battery comprising:

a positive plate including a positive collector comprising a metal having a plurality of openings and a positive active material layer on at least one surface of the positive collector;

a negative plate including a negative collector ~~in~~ comprising a metal foil ~~form~~ free of holes, and a negative active material layer ~~formed~~ on at least ~~on~~ one surface of the negative collector; and

a separator located between the positive and negative plates, for insulating the positive and negative plates from each other.

2. (Twice Amended) The lithium polymer battery of claim 1, wherein the negative collector is a copper ~~(Cu)~~ foil.

4. (Twice Amended) The lithium polymer battery of claim 2, wherein the positive and negative active material layers are coatings of positive and negative active material slurries, respectively, on at least one surface of the positive collector and at least one surface of the negative collector, respectively.

Add the following claims:

6. (New) The lithium polymer battery of claim 1, wherein the positive plate includes the positive active material layer on both sides of the positive collector and the negative plate includes the negative active material layer on both sides of the negative collector.

7. (New) A lithium polymer battery comprising:

a positive plate including a positive collector comprising a metal having a plurality of openings and a positive active material layer on at least one surface of the positive collector;

a negative plate including a negative collector consisting of a metal foil free of holes, and a negative active material layer on at least one surface of the negative collector; and

a separator located between the positive and negative plates, for insulating the positive and negative plates from each other.

8. (New) The lithium polymer battery of claim 7, wherein the negative collector is a copper foil.

9 (New) The lithium polymer battery of claim 7, wherein the positive collector is expanded metal.

10. (New) The lithium polymer battery of claim 7, wherein the positive collector is punched metal.

11. (New) The lithium polymer battery of claim 7, wherein the positive and negative active material layers are coatings of positive and negative active material slurries, respectively, on at least one surface of the positive collector and at least one surface of the negative collector, respectively.

12. (New) The lithium polymer battery of claim 7, wherein the positive plate includes the positive active material layer on both sides of the positive collector and the negative plate includes the negative active material layer on both sides of the negative collector.

13. (New) A lithium polymer battery comprising a plurality of bi-cells stacked on each other wherein each bi-cell comprises

a positive plate including a positive collector comprising a metal having a plurality of openings, a positive active material layer on both surfaces of the positive collector, and a positive tap electrically connected to the positive collector;

a negative plate including a negative collector comprising a metal foil free of holes, a negative active material layer on both surfaces of the negative collector, and a negative tap electrically connected to the negative collector; and

a separator located between the positive and negative plates, for insulating the positive and negative plates from each other, wherein the positive taps of the bi-cells are connected together as a first terminal of the battery and the negative taps of the bi-cells are connected together as a second terminal of the battery.

14. (New) The lithium polymer battery of claim 13, wherein the negative collector is a copper foil.

15. (New) A lithium polymer battery comprising a plurality of bi-cells stacked on each other wherein each bi-cell comprises

a positive plate including a positive collector comprising a metal having a plurality of openings, a positive active material layer on both surfaces of the positive collector, and a positive tap electrically connected to the positive collector;

a negative plate including a negative collector consisting of a metal foil free of holes, a negative active material layer on both surfaces of the negative collector, and a negative tap electrically connected to the negative collector; and

a separator located between the positive and negative plates, for insulating the positive and negative plates from each other, wherein the positive taps of the bi-cells are connected together as a first terminal of the battery and the negative taps of the bi-cells are connected together as a second terminal of the battery.

16. (New) The lithium polymer battery of claim 15, wherein the negative collector is a copper foil.